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Electric Vehicles in India: A Five-Year Performance Analysis

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Abstract

This research paper is an analysis of top Electric vehicle companies in India. It talks about the current size of the EV market in India. There's a detailed analysis of the industry leader TATA Motors and its highest-selling car TATA TIAGO. Additionally, it includes performance analysis of Mahindra, Hyundai etc.

Introduction:

The automotive landscape in India has been undergoing a significant transformation over the last five years, marked by the growing presence and adoption of electric vehicles (EVs). This shift towards electric mobility is not only an environmental imperative but also a strategic response to the nation's energy security and sustainability challenges. As college students engaged in research, it is essential to understand and analyse how the electric vehicle market has evolved in India, the factors driving its growth, and the challenges it faces.

The rise of electric vehicles in India can be attributed to various factors, including increasing concerns over air pollution, fluctuating oil prices, and a growing awareness of the need for sustainable transportation solutions. The Indian government has also played a pivotal role by implementing policies and incentives aimed at promoting EV adoption, such as the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme. These initiatives have created a conducive environment for both domestic and international automakers to invest in EV production and infrastructure development.

In this research paper, we will delve into the performance of electric vehicles in India over the last five years, focusing on key aspects such as sales figures, market share, technological advancements, and the emergence of charging infrastructure. By analysing this data, we aim to provide a comprehensive overview of the electric vehicle ecosystem in India, shedding light on its growth trajectory and the challenges that lie ahead.

Furthermore, this study will also explore the potential socio-economic and environmental impacts of EV adoption in India. We will assess how EVs contribute to reducing greenhouse gas emissions, dependence on fossil fuels, and their potential to create new job opportunities in the electric vehicle industry.

As college students embark on this research journey, we hope that this paper will serve as a valuable resource for understanding the current state of electric vehicles in India and their role in shaping the future of transportation in the country. Through rigorous analysis and examination of empirical data, we aspire to contribute to the ongoing discourse on sustainable mobility and its implications for India's economic and environmental landscape.

RETAIL SALES OF THE INDIAN ELECTRIC VEHICLE INDUSTRY IN FIRST-HALF 2023							
EV segment	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**Total**
2-wheelers	64,678	66,069	86,303	66,789	1,05,338	45,734	4,34,914
3-wheelers	34,324	36,022	45,265	38,033	44,617	48,009	2,46,270
PVs	3,438	4,756	8,824	6,009	7,640	7,692	38,359
Goods vehicles	130	149	313	285	196	194	1,267
Buses	96	87	74	84	271	200	812
Others	173	92	38	8	35	3	349
Total	**1,02,839**	**1,07,175**	**1,40,817**	**1,11,208**	**1,58,097**	**1,01,832**	**7,21,971**
Data: Vahan							

India's Electric Vehicle Retail Sales Surge, Reaching 700,000 Units in H1 2023

In the first half of the calendar year 2023, retail sales of electric vehicles (EVs) in India surpassed a significant milestone, surging to 721,971 units by the end of June 2023, according to data sourced from Vahan and referenced on July 1st. This figure represents a remarkable achievement, already accounting for 73% of the total EV sales recorded in the entire calendar year 2022.

Notably, the year 2022 witnessed India's EV sales reaching the historic one-million-unit mark for the first time, totalling 1,024,739 units, reflecting a staggering year-on-year growth of 210%.

The primary drivers of this substantial growth in the first half of 2023 have been electric two-wheelers and three-wheelers, widely regarded as the more accessible and cost-effective segments within the EV industry compared to electric cars, commercial vehicles, and buses. Electric two-wheelers, comprising 434,914 units, represent a substantial 60% share of the total sales, while three-wheelers, with 246,270 units sold, command a significant 34% share of the burgeoning EV market.

In the electric car and SUV category, a total of 38,359 units were sold, equating to a 5.31% market share. Commercial vehicles, encompassing goods carriers and buses, contributed 0.28% to the EV market with 2,079 units sold.

These impressive figures underscore the accelerating adoption of electric mobility solutions in India, signalling a promising trajectory for the nation's EV industry.

Halfway into CY2023, cumulative EV retails of 721,921 units are already 73% of CY2022's record million-plus sales (10,24,739 units).

Note: data collected from autocarpro (THE TABLE)

MARUTI SUZUKI

MARUTI SUZUKI'S PIONEERING MOVE INTO THE ELECTRIC VEHICLE MARKET

Maruti Suzuki, a stalwart in the automotive sector, is orchestrating a profound transformation to adapt to the electrified future of mobility. This iconic automaker has laid out an ambitious plan to introduce 5 to 6 new electric vehicle (EV) models, commencing in 2026. This strategic foray into the EV realm cements Maruti's position as a pivotal player in the dynamic and evolving electric vehicle landscape, ensuring its enduring relevance and competitive edge.

EXPANDING MARKET SHARE AND UNWAVERING CONFIDENCE

Maruti's strategic manoeuvring isn't limited to EVs alone. The company has orchestrated a remarkable surge in its market share within the SUV segment, catapulting from a modest 6% to a commendable 12%.

Their bold vision extends to achieving a substantial 25% market share within the current year, a testament to their unwavering confidence. As Maruti fortifies its footprint in the SUV domain, it harnesses the burgeoning consumer demand for these vehicles. Notably, the company's average selling price is on an upward trajectory, underscoring a positive trend in revenue growth and profitability.

TRANSITIONING FROM SMALL CARS TO EV DOMINANCE

Maruti's evolution transcends the boundaries of the SUV market, signifying a strategic departure from the perception of being exclusively associated with small cars. This transformation is particularly noteworthy given Maruti's formidable presence in the small car segment, where it reigns supreme. This stronghold in the small car market bestows upon Maruti a distinctive advantage as the EV era unfolds, as there is no immediate contender poised to seamlessly replace Maruti's dominance in this segment.

A COMPELLING INVESTMENT OPPORTUNITY

Eminent market analyst offers a conservative projection of a 50% increase in Maruti's stock value over the next two years. As Maruti's EV portfolio begins to make substantial contributions to its top-line revenue, further growth potential beckons. Maruti's strategic pivot toward electric vehicles harmonises with evolving consumer preferences and aligns seamlessly with the government's aggressive push toward electrified mobility solutions. Armed with a robust market position, an extensive distribution network, and a storied brand legacy, Maruti Suzuki emerges as a compelling contender for those seeking multi-bagger investment opportunities in the burgeoning electric vehicle industry.

Tata Motors' Remarkable Milestone: 100,000 Electric Vehicles Sold in Five Years

Tata Motors, a venerable name in the automotive industry, has achieved a momentous milestone by selling 100,000 electric vehicles (EVs) within five years. In a landscape where startups have predominantly led the two-wheeler EV industry, Tata Motors stands as a legacy brand that has defied conventions, emerging unchallenged in the four-wheeler EV space. Notably, the journey to this milestone was marked by distinct phases: the first 10,000 sales were accomplished in 44 months, the subsequent 40,000 in just 15 months, and the remaining 50,000 in a mere nine months.

In an exclusive conversation with Autocar India, Shailesh Chandra, the Managing Director of Tata Motors Passenger Vehicles and Tata Passenger Electric Mobility, expressed astonishment at the phenomenal growth of the brand's EV business. He admitted that the demand surpassed their expectations, with customers embracing the idea that EVs represent the future of automotive transportation. The transformation of customer perception has occurred at an accelerated pace, far exceeding their initial projections.

TATA TIAGO EV EMERGES AS A CHART-TOPPER

Tata Motors currently commands an imposing market share of over 85 per cent in the EV segment. A testament to its success, the Tiago EV, introduced just a year ago, has swiftly ascended to become India's best-selling electric vehicle, with more than 19,000 units sold since deliveries commenced in January 2023.

Tata Motors' journey towards this remarkable achievement commenced with the launch of the Nexon EV, where they struck the perfect balance: ample range for daily use, spirited performance, and an affordable price point, all elegantly packaged within an SUV body style. This formula has translated into impressive sales figures, with Tata Motors having already sold over 50,000 units of the Nexon EV. The introduction

of the more budget-friendly Tiago EV has further democratized EV ownership, offering a wider audience access to electric mobility. Additionally, the Tigor EV continues to complement the portfolio.

Looking ahead, Tata Motors has an ambitious roadmap, with plans to launch four new EVs within the next year: the Nexon EV facelift, Harrier EV, Punch EV, and Curvv EV, further reinforcing its position as a leader in the electric vehicle space.

Tata Motors Triumph in the EV Market: A Winning Formula

Tata Motors' success in the electric vehicle (EV) market can be attributed to two key factors. First, early adopters played a pivotal role by spreading positive word-of-mouth about the Nexon EV, reassuring potential buyers of its practicality for daily use. Many initial purchasers initially viewed EVs as secondary vehicles but transitioned to making them their primary and sole mode of transportation, eventually selling their conventional combustion engine cars.

The second significant factor was government policy support. The central government's decision to impose only a 5% Goods and Services Tax (GST) on EVs, compared to the 28% GST on internal combustion engine (ICE) vehicles, created a favourable environment for EV adoption. Furthermore, various state-level policies, such as exemptions from road and registration taxes, further incentivized consumers to embrace EVs.

Tata Motors' entry into the EV market in 2018 was indeed a gamble, given the unprepared state of the market for electrification. Nevertheless, the company made a strategic choice to convert an existing ICE model into an EV, a cost-effective approach that required only a fraction of the investment needed for developing a born-electric vehicle platform. This pragmatic decision has undoubtedly contributed to their remarkable success in the EV segment.

Hyundai Electronic Vehicle Sales in India in 2022-2023

According to industry estimates, Hyundai sold over 1,000 electric vehicles in India in 2022-2023. This represents a significant increase from the previous year when Hyundai sold only 132 electric vehicles in India.

Hyundai's electric vehicle sales in India are still relatively small compared to other automakers, such as Tata Motors and MG Motors. However, Hyundai is ramping up its electric vehicle production and sales in India, with plans to launch several new electric vehicles in the coming years.

Hyundai's electric vehicle sales in India are being driven by several factors, including government incentives, increasing consumer awareness of electric vehicles, and the growing availability of charging infrastructure.

The Indian government offers several incentives for electric vehicle buyers, including a subsidy of up to ₹15 lakh (~$19,000) for the purchase of an electric car. This has helped to make electric vehicles more affordable for consumers in India.

Consumer awareness of electric vehicles is also increasing in India, as more and more people learn about the benefits of electric vehicles, such as their lower running costs and environmental impact.

Finally, the availability of charging infrastructure is also improving in India, with more and more charging stations being installed across the country. This makes it easier for electric vehicle owners to charge their vehicles.

Hyundai is well-positioned to capitalize on the growing demand for electric vehicles in India. The company has a strong brand reputation in India, offering a range of competitive electric vehicles. Hyundai is also investing heavily in its electric vehicle production and sales in India.

In the coming years, Hyundai is expected to play a leading role in the electric vehicle market in India.

India: key global market for Hyundai

HYUNDAI MOTOR INDIA SALES				HYUNDAI MOTOR GLOBAL SALES		
Month	CY2023	CY2022	% growth	CY2023	Units	India share (%)
January	50,106	44,022	14%	January	3,06,296	16.35%
February	47,001	44,050	7%	February	3,27,718	14.34%
March	50,600	44,600	13%	March	3,81,885	13.25%
April	49,701	44,001	13%	April	3,36,212	14.78%
May	48,601	42,293	15%	May	3,49,194	13.91%
June	50,001	49,001	2%	June	3,75,113	13.32%
Total	**2,96,010**	**2,67,967**	**10%**	**Total**	**20,76,418**	**14.25%**

Mahindra and Mahindra Emerges as Top EV Seller in India in 2022-2023

Mahindra and Mahindra emerged as the top electric vehicle (EV) sellers in India in 2022-2023, selling over 10,000 units of its electric vehicles during the period. This represents a significant increase from the previous year when Mahindra sold only 2,000 electric vehicles in India.

Mahindra's electric vehicle sales in India are being driven by the success of its XUV400 EV SUV. The XUV400 EV is a popular choice among consumers in India due to its affordable price, long-range, and spacious interior.

Mahindra is also ramping up its production and sales of electric vehicles in India. The company has plans to launch several new electric vehicles in the coming years, including an electric version of its popular Thar SUV.

Mahindra's success in the EV market is a testament to the company's commitment to sustainable transportation. Mahindra is also playing a leading role in the development of the EV ecosystem in India. The company is investing heavily in charging infrastructure and other supporting facilities.

Mahindra's success in the EV market is also a boon for the Indian government, which is aiming to electrify 30% of its passenger vehicles by 2030. Mahindra's success shows that it is possible to produce and sell affordable electric vehicles in India.

Mahindra is well-positioned to continue its dominance of the EV market in India in the coming years. The company has a strong brand reputation, a wide range of electric vehicles, and a commitment to sustainable transportation.

Review of Literature

comparative study on electric vehicle sales in India would be a valuable contribution to the literature on electric vehicles, as it would provide insights into the factors that are driving and hindering electric vehicle adoption in India.

One of the key areas of focus for such a study would be to compare the sales of different electric vehicle manufacturers in India. This would help to identify the manufacturers that are leading the way in terms of electric vehicle adoption, as well as the manufacturers that are struggling to gain market share.

Another key area of focus for such a study would be to compare the sales of different electric vehicle segments in India. This would help to identify the segments that are most popular among consumers, as well as the segments that have the most growth potential.

Finally, such a study would also need to consider the impact of government policies and incentives on electric vehicle sales in India. This would help to understand the role that government policy can play in promoting electric vehicle adoption.

A comparative study on electric vehicle sales in India would be a valuable contribution to the literature on electric vehicles, as it would provide insights into the factors that are driving and hindering electric vehicle adoption in India. Such a study would also be of interest to policymakers, industry players, and consumers alike.

Here are some specific research questions that could be addressed in a comparative study on electric vehicle sales in India:

- What are the market shares of different electric vehicle manufacturers in India?
- What are the sales trends for different electric vehicle segments in India?
- What is the impact of government policies and incentives on electric vehicle sales in India?
- What are the key factors driving and hindering electric vehicle adoption in India?
- How does the electric vehicle market in India compare to other countries?

A comparative study on electric vehicle sales in India would be a complex undertaking, but it would be a valuable contribution to the literature on electric vehicles. Such a study would require the collection and analysis of a large amount of data, but it would provide valuable insights into the factors that are driving and hindering electric vehicle adoption in India.

Status of The Problem

The top automobile actors in India face several challenges in selling electric vehicles (EVs). These challenges include:

- High upfront cost: EVs are still more expensive than traditional gasoline-powered vehicles. This is due to the high cost of batteries and other EV components.
- Range anxiety: Many consumers are concerned about the range of EVs and whether they will be able to make long trips without having to recharge.
- Lack of charging infrastructure: There is a shortage of public charging stations in India, which makes it difficult for EV owners to charge their vehicles.
- Limited selection of EVs: The selection of EVs available in India is still relatively limited. This makes it difficult for consumers to find an EV that meets their needs.
- Government policies: The Indian government has not yet implemented comprehensive policies to support the adoption of EVs. This makes it difficult for automakers to invest in the production and sale of EVs.

In addition to these challenges, the top automobile actors in India are also facing competition from new entrants to the EV market. These new entrants are offering competitive EVs at lower prices.

Despite these challenges, the top automobile actors in India are committed to selling EVs. They are investing in developing new EV models and expanding their charging infrastructure. They are also working with the government to develop supportive policies for the EV market.

Here are some specific examples of the challenges that top automobile actors in India are facing in selling EVs:

- Tata Motors: Tata Motors is the leading EV seller in India, but it is facing increasing competition from new entrants, such as Ola Electric and Ampere Vehicles. Tata Motors is also struggling to meet the growing demand for its EVs.
- Hyundai Motor India: Hyundai Motor India is ramping up its production and sales of EVs in India, but it is facing challenges such as high upfront costs and range anxiety. Hyundai is also working to expand its charging infrastructure in India.

- Mahindra and Mahindra: Mahindra and Mahindra is another leading EV seller in India. However, the company is facing challenges such as supply chain disruptions and rising costs. Mahindra is also working to expand its production capacity for EVs in India.

The top automobile actors in India know the challenges they face in selling EVs. However, they are committed to overcoming these challenges and making EVs more affordable and accessible to Indian consumers.

Questionnaire on a Comparative Study on Electronic Vehicle Sales in India

Demographic Information 1. What is your age?

2. What is your gender?
3. What is your educational qualification? 4. What is your monthly income?
5. What type of vehicle do you currently own? Awareness and Perception of Electric Vehicles
6. Are you aware of electric vehicles?
7. What are your sources of information about electric vehicles? 8. What are the benefits of electric vehicles, according to you?
9. What are the drawbacks of electric vehicles, according to you?
10. How likely are you to consider purchasing an electric vehicle in the next 5 years? Factors Influencing Electric Vehicle Purchase Decision
11. What are the most important factors that would influence your decision to purchase an electric vehicle?
12. How important is the upfront cost of an electric vehicle to you? 13. How important is the range of an electric vehicle to you?
14. How important is the availability of charging infrastructure to you?
15. How important is the brand reputation of the electric vehicle manufacturer to you? 16. How important are the government incentives for electric vehicles to you?

Comparative Study of Electric Vehicle Manufacturers

17. Which electric vehicle manufacturers are you aware of?
18. Which electric vehicle manufacturers do you consider to be the most reliable?
19. Which electric vehicle manufacturers do you consider to offer the best value for money?
20. Which electric vehicle manufacturers do you consider to have the best charging infrastructure? EV ownership experience
21. If you own an EV, which make and model do you own? 22. How long have you owned your EV?
23. What motivated you to purchase an EV?
24. Have you previously owned a gasoline/diesel vehicle? If so, how does your EV experience compare? 25. What is your typical daily driving distance in miles/kilometres with your EV?
26. Where do you primarily charge your EV (home, workplace, public charging stations)? 27.How satisfied are you with the charging infrastructure in your area?
28. What is your average monthly charging cost compared to what you used to spend on fuel for a conventional vehicle?
29. Have you installed a home charging station?
30. Have you experienced any range anxiety with your EV? EV Charging and Range
31. How long does it typically take to charge your EV to 80% capacity?
32. Do you mainly use level 1 (110V), level 2 (240V), or DC fast charging? 33. Have you ever had difficulty finding an available charging station?
34. How important is fast charging capability to you when considering an EV?
35. Would you be interested in vehicle-to-grid (V2G) technology to sell excess energy back to the grid? 36. Are you aware of any government incentives or rebates for EV owners in your region?

Battery and range

37. How satisfied are you with the range of your EV on a single charge?
38. Have you experienced any significant degradation in your EV's battery capacity over time?
39. Do you typically charge your EV to 100% or only to a certain percentage to prolong battery life?
40. How are you concerned about the long-term sustainability and disposal of EV batteries?

EV maintenance and repair

41. How would you rate the overall maintenance and repair costs of your EV compared to a traditional gasoline/diesel vehicle?
42. Have you had any major repairs or issues with your EV?
43. Is finding a qualified EV mechanic or service centre easy in your area? Environmental and Ethical Considerations
44. Did environmental concerns play a role in your decision to buy an EV?
45. Do you believe that EVs are a more environmentally friendly alternative to traditional vehicles?
46. Are you aware of the carbon emissions reduction associated with driving an EV in your region?
47. Would you be willing to pay a premium for a more sustainable or ethically produced EV? Future of EV
48. Do you think the EV charging infrastructure will continue to improve in your area? 49. How do you see the future of EVs in terms of technology and affordability?
50. Would you consider switching back to a conventional vehicle in the future? 51. What improvements or features would you like to see in future EV models? 52. Are you interested in autonomous driving features in EVs? Market perception
53. What do you believe are the main barriers preventing more people from adopting EVs? 54. Do you think there is sufficient information available to potential EV buyers?
55. How influential are reviews and recommendations from friends or family in your decision to buy an EV?
56. Have you influenced others to consider purchasing an EV? Government Policies
57. Are you aware of government policies and initiatives supporting EV adoption in your region? 58. Have government incentives influenced your decision to purchase an EV?
59. Do you believe that more government support is needed to accelerate EV adoption?
60. Would you support stricter emissions standards for traditional vehicles to promote EV adoption?
61. Should governments invest in expanding public charging infrastructure? Future Purchase Intentions
62. Would you consider purchasing another EV in the future?
63. What factors would most influence your decision to buy another EV or switch to a different type of vehicle?

This questionnaire is designed to collect data on a variety of factors that influence electric vehicle purchase decisions in India, including awareness and perception of electric vehicles, factors influencing electric vehicle purchase decisions, and a comparative study of electric vehicle manufacturers. The data collected from this questionnaire will be used to conduct a comparative study on electric vehicle sales in India.

The questionnaire is designed to be easy to understand and complete. It consists of a mix of open-ended and closed-ended questions. The open-ended questions allow respondents to provide their insights and opinions, while the closed-ended questions allow for quantitative analysis.

The questionnaire is estimated to take about 10-15 minutes to complete. It can be distributed to potential respondents electronically or in person.

DATA ANALYSIS

1. Market Overview: The EV market has been experiencing substantial growth worldwide. Governments and consumers were increasingly focused on reducing carbon emissions and promoting sustainability, which drove the demand for EVs.

2. Type of electric vehicles: The market includes various types of EVs, such as battery electric vehicles (BEVs) that rely solely on electric power, plug-in hybrid electric vehicles (PHEVs) with both electric and gasoline power, and hydrogen fuel cell vehicles, which used hydrogen to generate electricity.

3. Government Policies and Incentives: The Indian government has introduced several policies and incentives to promote the electric vehicle (EV) market and reduce the country's dependence on fossil fuels such as the FAME Scheme, GST reduction, Incentives for charging infrastructure, and Import duty reduction.

4. Major Players and Market Share: TATA Motors captured the major market share of 72% of the whole EV industry of India selling more than 34,000 electric vehicle models such as Tiago, Nexon and Tigor in the first half of 2023.

5. Charging Infrastructure: The EV charging industry shows promising growth, by 2030 the Confederation of Indian Industry has anticipated installing approximately 1.32 million charging stations across India.

6. Consumer Adoption: The rate of EV adoption varied by region, with some areas having a higher percentage of EVs on the road than others. Factors such as government policies, consumer awareness, and charging infrastructure influenced adoption rates.

7. Barriers to Adoption: There are several factors which influence the adoption rate of EVs such as scepticism about the technology, range anxiety, lack of charging stations, ownership cost and lack of consumer awareness about the EV.

8. Economic and Environmental Impact: EVs were generally considered more environmentally friendly than traditional internal combustion engine vehicles due to their lower emissions. However, their environmental impact also depended on factors like the source of electricity generation and battery recycling.

9. International Competition: Companies such as Tesla, and Hundyai dominate the global EV industry with only 5% market share in India. India aims to achieve 100% locally produced Electric Vehicles under the Make in India initiative. India is also emerging in the global EV market by providing cheaper vehicles with better ranges

10. Future Outlook: India appeared promising, with several trends and factors pointing towards increased EV adoption such as government initiatives, rapid growth, and introduction of new and advanced technologies.

CONCLUSION

The growth of electric vehicles (EVs) in India is on an upward trajectory, underpinned by a combination of government incentives, increasing environmental awareness, expanding charging infrastructure, and automaker investments. The Indian government's initiatives, such as the FAME-II scheme and GST reductions, have made EVs more affordable and accessible to consumers. The push for cleaner, more sustainable transportation, driven by concerns about air pollution, has spurred interest in EVs.

Furthermore, the growth of charging infrastructure and economic viability improvements for EVs are facilitating their adoption. With a burgeoning market for electric two-wheelers and three-wheelers in urban areas and a focus on rural electrification, India is positioned for significant growth in the EV sector. As automakers continue to invest in the Indian market and consumer awareness increases the future of EVs in India appears promising.